Claims

[1] An electron beam irradiator comprising:
a vacuum chamber having a beam irradiation window formed longitudinally in an outer periphery of the vacuum chamber;
a cathode placed centrally and longitudinally inside the vacuum chamber, and having a field emitter tip formed on the cathode, corresponding to the beam irradiation window; and
a high voltage supply placed at one end of the vacuum chamber, and adapted to apply high voltage toward the cathode.

[2] The electron beam irradiator according to claim 1, wherein the field emitter tip is made of a carbon nanotube.

[3] The electron beam irradiator according to claim 1, wherein the cathode is of a rod-shaped structure having a circular cross-section, and includes a field emitter tip shaped as a strip formed longitudinally in an outer periphery of the rod-shaped structure.

[4] The electron beam irradiator according to claim 3, wherein the field emitter tip is formed along the circular cross-section of the cathode to radially emit electron beams.

[5] The electron beam irradiator according to claim 1 or 3, further comprising:
fixing flanges integrally provided at both ends of the vacuum chamber;
a first vacuum flange coupled with one of the fixing flanges, and having a high voltage supply;
a second vacuum flange coupled with the other one of the fixing flanges;
a first support including a pin insert hole formed at one end of the cathode and a first insulator formed in the high voltage supply for the passage of a connector pin of the high voltage supply so that the connector pin is inserted into the pin insert hole of the cathode through the first insulator; and
a second support including an insert groove formed in a second insulator longitudinally and axially in a central potion of the second vacuum flange so that an insert protrusion formed at the other end of the cathode is inserted into the insert groove to support the cathode.

[6] The electron beam irradiator according to claim 5, wherein the second insulator of the second support has a plurality of prominences and depressions formed on the second insulator to extend surface passages thereof in order to prevent insulation breakdown under high voltage.

[7] The electron beam irradiator according to claim 1, wherein the beam irradiation window comprises:

a base plate fixed to the vacuum chamber, slightly protruded from the vacuum chamber to the outside, and having an elongated rectangular slit formed in a central area thereof;
a metal wire inserted into an insert groove formed in an outer periphery of the slit of the base plate;
a metal foil placed on the metal wire, and having an area slightly larger than an area surrounded by the metal wire; and
a cover plate coupled with the base plate, corresponding to the slit of the base plate, and having a beam irradiation slit corresponding to the slit in the central area of the base plate.

[8] The electron beam irradiator according to claim 1 or 3, wherein the vacuum chamber is cylindrical, with a plurality of beam irradiation windows formed in an outer periphery thereof, and wherein the cathode placed inside the vacuum chamber has field emitter tips formed in an outer periphery of the cathode, corresponding to the beam irradiation windows of the vacuum chamber, respectively.

[9] The electron beam irradiator according to claim 8, wherein the electron beam windows are formed at both sides of the vacuum chamber to provide treatment to an object that moves linearly outside the vacuum chamber.

[10] The electron beam irradiator according to claim 8, wherein the electron beam windows are formed at three sides of the vacuum chamber to provide treatment to an object that moves around the vacuum chamber.

[11] The electron beam irradiator according to claim 8, wherein the electron beam windows are formed at four sides of the vacuum chamber to provide treatment to a cylindrical object while the vacuum chamber is rotated inside the cylindrical object.

[12] An electron beam irradiator comprising:
a vacuum chamber having a plurality of beam irradiation windows formed longitudinally in an outer peripheral area of the vacuum chamber;
a cathode placed inside the vacuum chamber, and having at least one linear area formed thereon and a plurality of field emitter tips formed on the linear area, corresponding to the beam irradiation windows, respectively; and
a high voltage supply placed at one end of the vacuum chamber, and adapted to apply high voltage toward the cathode.

[13] The electron beam irradiator according to claim 12, wherein the vacuum chamber has at least one linear area opposed in parallel to the linear area of the cathode, in which the beam irradiation windows are formed.